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FARMERS' SEED SYSTEM AND THE INSTITUTIONALISATION OF GENETIC RESOURCE USE AND MANAGEMENT IN AGRICULTURE:

A CASE OF SEED SUPPLY FOR LOCAL TRADITIONAL VEGETABLES IN JAPAN

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Abstract — Nearly all countries have seed laws and technical regulations to govern their formal seed system, run by formal public organisations and private seed companies, while the role of the farmers' seed system has been marginalised especially in developed countries. Local traditional varieties that are largely taken care of and nurtured by farmers' seed system have also been excluded from the formal seed system. Nowadays, however, it is quite common to see locally-sourced vegetables on supermarket shelves, while an increasing number of consumers visit farmers' market and become aware of local traditional vegetables available only through such channels. It is in this context that many local governments, public agricultural experimental stations, and even private seed companies are becoming interested in the use and management of local traditional varieties of vegetables in Japan. The objective of this paper is to elucidate some characteristics of and factors behind the condition, potentiality and limitations of farmers' seed systems vis-à-vis the expected role of public experimental stations and locally-based seed companies, especially when it comes to the use and management of local traditional vegetables and their genetic resources in Japan. This paper is based on our case studies, in which we conducted some interviews with relevant local actors in addition to literature and statistical surveys.

Key words : farmers' seed system, local vegetables, genetic resources, institutionalisation

1. INTRODUCTION

As greater investments in agricultural R&D have been made by the private seed sector, intellectual property and breeders' rights (IPR regime) have moved to the centre stage of the plant seed and genetic resource use and management even in the developing world. Many civil society and peasant organisations criticise the enforcement of IPR regime for infringing on farmers' rights to save and use their own seeds. At the same time, however, some civil society organisations and international aid agencies recognise the potential efficacy of the so-called farmers' seed system (Louwaars 2007) in promoting sustainable rural development, especially in terms of biodiversity conservation and farmers' empowerment. Thus increasing attention has focused on how to re-evaluate and re-establish the farmers' seed system in the context of agrarian development. But, it is not the case only for developing countries.

Nearly all countries have seed laws and technical regulations to govern their formal seed system, run by formal public organisations and private seed companies, and the role of the farmers' seed system has been marginalised especially in developed countries. However, there have been increasing concerns about (i) the corporate control over seed and genetic resources, (ii) the potential social and economic value of local traditional varieties that have long been excluded from the formal seed system, and (iii) the availability of organic seed for the burgeoning organic farming sector. These concerns feed into the attention to be focused on the potential role of the farmers' seed system in developed countries as well. In this paper we are going to take a look at the second line of concerns focused on local traditional vegetables in Japan[1].

There can be found two trends in terms of growing interests in farmers' seed system, or to put it differently, farmers' seed saving or their involvement in the process of seed conservation, seed improvement, seed production and seed distribution. First, there are emerging naturalist farmers, organic farmers and hobby farmers who have newly launched seed saving initiatives based on their normative and advocative motivations, such as: seeds must be saved by farmers themselves to create their own varieties quite adaptable to their farm environment; seed saving must be an integral part of farming and a way of communication between human and the nature, and so on. These initiatives are usually carried out on an individual basis, but seem to be intrigued by recent campaigns by some organic farmers and seed savers and their publications, including a translation of Michel and Jude Fanton's Seed Savers' Handbook in 2002 and its Japanese version in 2006.

Second, there are more practical initiatives that have been practiced traditionally by skilled farmers, growers of local traditional vegetables, and some organic farmers. Even without any special belief or normative consciousness they just keep on seed saving practices for ancestral succession of local varieties often regarded as their own assets. Some are just intended to keep growing their own seeds, while others are interested in crop production for the market. These skilled farmers and their practice, techniques, knowledge, and resources, are being appropriated by formal seed systems.

As commonly experienced across industrial countries, local traditional varieties have been disappearing and their genetic diversity has been eroded due to the spread of "Fordist" mode of market economy, characterised by mass-production, mass-distribution and mass-consumption, in which hybrid varieties are well suited and indeed have overwhelmed farm fields and the agricultural market since the late 1960s and 1970s. This is especially true of the vegetable sector in Japan. Major seed companies and public agricultural research organisations have shown less interest in local varieties since that period. It is historically skilled farmers or growers of those almost-disappearing vegetables who have been and still are involved in genetic resource use and management of local traditional varieties, and in some cases in collaboration with locally-based small and medium sized seed companies and local public extension services that also have knowledge and techniques in terms of both seed and crop production of those varieties.

Interestingly enough, however, since the late 1980s (post-Fordist era), something new or different in terms of quality (shape, colour, taste, etc.) have been in demand on the market, and produce that is local, traditional or ecological has gained growing attention traditional or ecological, as agro-food studies on the "consumption turn" (Goodman 2002) or "quality turn" (Goodman 2003). in the 1990s and early 2000s have shown. Nowadays, it is quite common to see locally-sourced vegetables on supermarket shelves, while an increasing number of consumers visit farmers' market and become aware of local traditional vegetables available only through such channels. It is in this broad context that many local governments, public agricultural experimental stations, and even private seed companies are becoming interested in the use and management of local traditional varieties of vegetables in Japan.

Our on-going experience of revival of local traditional vegetables and accompanying attentions to genetic resource use and management are not necessarily unique to Japan. Many aspects can be found in European countries, but some might be unique to the historical, ecological, cultural, and socioeconomic context of Japanese agriculture and food sector. The objective of this paper is to elucidate some characteristics of and factors behind the condition, potentiality and limitations of farmers' seed systems vis-à-vis the expected role of public experimental stations and locally-based seed companies, especially when it comes to the use and management of local traditional vegetables and their genetic resources in Japan. This paper is based on our case studies, in which we conducted some interviews with relevant local actors in addition to literature and statistical surveys. Before discussing seed systems and local traditional vegetable initiatives in detail, we are going to give a brief outline of the agricultural sector in Japan.

2. OVERVIEW OF THE AGRICULTURAL SECTOR IN JAPAN

Since the late 1980s, Japanese agriculture has been shrinking year by year. Japanese agriculture is characterised by (i) a scarcity of arable land, the amount of which is undergoing long-term decline: arable land in 2009 was 4.61 million hectares, a decrease of 14% since 1985 (24% since the peak of 1961), and utilization rate of cultivated land was 92% in 2008, also down from 105% in 1985 (138% in the peak of 1956); (ii) an increase of abandoned cultivable land areas: 386 000 hectares in 2005, increased nearly threefold over the same period; (iii) small farm sizes: the average size of commercial farm households in 2009 was 1.41 hectares, excluding Hokkaido region where the average size was 20.5 hectares; (iv) low wages and falling agricultural incomes: the average wage in agriculture for males in 2005 was 62% of the average national wage in industry, and earnings from agriculture provided only 23% of total farm household income in 2008; (v) numbers of part-time and aging farmers are sharply increasing: the proportion of commercial farm households with full-time farmers under 65 years of age was only 20%, while the proportion of commercial farmers aged 65 years or over was 61%; and (vi) a lack of agricultural successors: the proportion of commercial farm households with successors engaged fully or mainly in farming was 6.8% in 2005 (MAFF 2005, and some additional statistical data). This downward trend has been exacerbated by government policies under external (the U.S. and WTO regime, promoting free trade and urging reduction in domestic support and protection) and internal (mainstream business circles, demanding deregulation of family-farm based agricultural policy) pressures. As a result of such political pressure as well as its topographical conditions, Japan's self sufficiency ratio of food is just 40% on calories basis, or self-sufficiency in grains is only 28% by weight.

On the other hand, it might be safe to say that Japan is relatively rich in terms of biodiversity, with the land extending north and south, hot summer and cold winter, a lot of rainfall, fertile and productive soil, a lot of mountains and forest covering 70% of the land, and so on. These conditions are very suitable for food production, but not for commercial agriculture.

Japan has a long history as an independent sovereign country, having absorbed various different cultures and adapted them to its own unique conditions. The topographical,

historical, and cultural conditions of Japan have resulted in rich diversity of traditional rural culture, including culinary culture derived from rich diversity of varieties and species of vegetables as well as other crops. Many of vegetable varieties have been introduced from other countries, but domesticated to each region and local area with different conditions.

What is also unique to Japan is the fact that Japanese people are "fastidious" about the aesthetic quality and nuanced taste (delicacy) of food. This makes them unsatisfied with "Fordist" kind, industrialised and standardised food, opening a niche space for local traditional vegetables to be refocused after decades of being lost. At the same time, however, this "turn of attention" is not just a reflection of "cultural turn" or "consumption turn". It is rather linked to and being prompted by socio-economic necessities. In general, local traditional varieties are likely to be seen as local cultural heritages, or "narrative" of anything local, such as culinary culture linked with traditional festivities, and history of local settlements and skilled farmers' (local dignitaries) activities. They are also seen as genetic resources to be exploited for breeding new varieties, and that's why the conservation and enhancement of biodiversity is paid increasing attentions even in economic terms. Finally but not the least, local traditional varieties are regarded, or expected, to be tools to revitalise local agriculture and rural economies, especially from the point of view of local governments and rural communities. This aspect is quite important given that local agriculture is nowhere robust and struggling to survive in even more difficult situations of Japanese agricultural sector as a whole.

3. STRUCTURE OF JAPANESE SEED SYSTEMS

Seed systems are usually analysed into two systems. Formal Seed Systems, operated by public research institutions and/or private seed companies, are the one type overwhelmingly identified in developed countries. They cover basic research, genetic resource collection and storage, plant breeding, seed production or multiplication, seed distribution, and farming guidance. Japanese formal seed systems can be divided into the main crop seed system undertaken largely by public organisations, and the vegetable seed system largely controlled by private seed companies. Among the public sector entities, National Institute of Agrobiological Sciences (NIAS) is equipped with national Genebank, while the network of 13 stations under the National Agriculture and Food Research Organisation (NARO) is serving sub-Genebanks along with being charged with basic plant research and plant breeding activities. When it comes to the public sector's involvement in genetic resource use and management for local varieties even of vegetables, the role of agricultural experimental stations in 47 prefectures is significant. In seed production and distribution at the local level, agricultural cooperatives (hereafter, JA cooperatives), under which growers associations are organised for both seed and crops, also play an important part. When the Main Crop Seed Law was amended in 1986 to deregulate the rice seed market, several major agribusiness companies (including Mitsubishi Chemical's Plant Research Institute, Mitsui Chemicals, Sumitomo Chemical, Japan Tobacco, and Kirin Brewery) managed to enter the business (Hisano 1999), but largely in vain[2]. This is mainly because the public seed system functions very well and has developed many excellent varieties and provided farmers with high quality seeds at low prices.

In the vegetable seed sector, on the other hand, there are many seed companies (including multinational ones such as Takii Seed and Sakata Seed) developing and producing hybrid varieties in large part (Hisano 1998). Japan Seed Trade Association consists of 1 310 member companies, out of which less than 100 companies assume the high level of breeding functions. This means that the majority of seed companies are small and medium-sized local dealers, but some of them still hold their original strains of certain vegetables, which they once worked on to create local new varieties. Some of these small and medium-sized companies are working together with local governments and public experimental stations to manage local genetic resources.

During the past decade, domestic seed production base has been deteriorating, with the number of seed producers rapidly decreasing from approximately 30 000 in the beginning of the 1980s to less than 10 000 in the end of the 1990s (since 1999 there is no statistical survey of the seed production area, volume, numbers of producers and associations). Instead, the seed import has steadily increased over the same period. This growing dependence on seed imports is of growing concern to the government and even private seed companies getting worried about Japan's "national seed security" (STAFF 2009). This downward trend of domestic seed production base is also induced by the shift from local inbred lines to hybrid lines, although seed companies still depend on domestic skilled seed growers for inbred lines of local traditional varieties, which are either cultivated for a niche market or used as parent lines for hybrids. It is locally-based small seed companies and skilled seed farmers with their breeding and seed production techniques as well as local genetic resources that have long been taking care of local traditional varieties, but now they are on the verge of disappearing.

Farmers and farmers' groups are increasingly motivated to work on seed saving schemes for the reasons mentioned above, such as: (i) ancestral succession of local traditional seeds by skilled farmers from generation to generation, either on an individual family basis or a local community basis; (ii) normative and advocacy initiatives led by seed savers and some organic farmers; and (iii) seed saving as a challenging hobby, practiced by hobby farmers and active gardeners. However, seed saving is an arduous task requiring specialised skills. With the exception of the first type of farmers, seed savings practiced in these individual or group initiatives are not meant to sustain original lines of local traditional varieties. When these genetic resources are used for commercial production to sell on the market with a special (registered) name of variety, however, individual or group initiatives without institutional support or careful management of variety lines are likely to go through a confusion of varieties, in terms of the size, shape, flavour, maturity, and other phenotypic traits of original lines. Local traditional varieties are not suitable for the market economy in the first place and therefore almost abandoned in the formal seed system for a long time, in spite of their values as genetic resources. From that point of view, what we need to consider is whether these seed saving initiatives should be institutionalised and supported or complemented by the formal seed system, and how.

The table shows the list of local initiatives aimed at promoting local traditional vegetables across Japan. This is not exclusive because almost all of prefectures have their own local traditional varieties and associated local culinary cultures. But, they are not necessarily under the same conditions. The most and foremost example is Kyoto's *Kyo-yasai* (*yasai* means vegetables), followed by Osaka's *Naniwa-yasai*, Kanazawa City's (Ishikawa Prefecture) *Kaga-yasai*, and Nagano's *Shinshu-yasai*. Kyoto and Nara Prefectures are historical cities (i.e. ancient capitals: between 6th and 8th centuries in Nara, and between 8th and 19th centuries in Kyoto) and Osaka once was the centre of commercial trading (Osaka is next to Kyoto and Nara). Aichi has long been since the Edo Era (17th-19th centuries) a main region for vegetable production and therefore plays a major role in the seed trade as well, with seeds of various vegetable varieties coming from and going out to other regions. Nagano Prefecture is a province of mountains with nine of the twelve highest mountains in Japan located there. These mountains have made the prefecture relatively isolated from outside as well as within, ideal conditions for evolving various local traditional vegetables and culinary cultures. In a broad way, these examples can be grouped into several categories according to who are assuming a leading role: local government and agricultural experimental station (*Kyo-yasai*, *Naniwa-yasai*, *Hiroshima-yasai*, etc.), local seed companies (*Aichi-yasai*, *Kaga-yasai*, *Yamato-yasai*, etc.), and local municipalities and local farmers' association with support from regional university (*Shinshu-yasai*). In the following section, we will discuss in more depth the two cases of initiatives for promoting local traditional vegetables, Kyoto's *Kyo-yasai* and Nara's *Yamato-yasai*.

Table 1. Some Examples of Genetic Resource Use and Management of Local Traditional Vegetables

Prefecture	Appellation (no. of varieties)	Year of the Institutionalisation	Main Actors (for seed/vegetable productions)	Logo of Brand
Kyoto	*Kyo-yasai* *Kyo-no-Dentouyasai* *(37+3)*	A: 1960s B: 1974 C: 1989	**Kyoto Pref. Govt / Ag Exp. Station,** **Kyoto JA / local JAs,** Kyoto Pref. University	
	Kyo-no-Shunyasai	A/B: 1962 C: 1999	**Kyoto City Govt,** **Local skilled farmers**	
Nara	*Yamato-yasai* *(21)*	A/B: 2005 C: 2005	**Local seed companies,** **Nara Pref. Govt,** Local farmers	
Osaka	*Naniwa-yasai* *(17)*	A: 1985 B: 2000 C: 2005	**Osaka Pref. Govt / Ag Exp. Stations,** Osaka Pref. University, Local JAs, Local communities, NPOs	
Nagano	*Shinshu-no-Dentouyasai* *(57)*	A: 1996 C: 2007	**Nagano Pref. Govt,** **Local municipalities**, **Local JAs**, **Shinshu University**, Local farmers, Local seed companies	
Aichi	*Aichi-no-Dentouyasai* *(35)*	A/B: __ C: 2002	**Local seed companies,** Aichi Pref. Govt, Local NPOs	
Ishikawa (Kanazawa)	*Kaga-yasai* *(15)*	A: 1991 B/C: 1997	**Local seed companies,** Kanazawa City Govt / Ag Exp. Station, Local JAs	
Hiroshima	*Hiroshima-Otakarayasai* *(5000 in Gene bank)*	A/B: 1989 C: 2010	**Hiroshima Pref. Govt / Ag Exp. Station & Gene bank,** Local farmers, etc.	

Note: A= Collections, evaluations, identifications of local traditional varieties; B= Genetic preservations (ex situ, field genebanks); C= Branding and marketing promotion

4. LOCAL TRADITIONAL VEGETABLES IN KYOTO (*KYO-YASAI*)

4.1 Background of Kyoto agriculture

Kyoto is the former medieval capital of Japan between 8th and 19th centuries, and still enjoys its status as a historical and cultural city, attracting a lot of tourists from home and abroad. Against such a background of the centre of the historical and cultural aspects of Japan, there have been evolved rich and unique traditions of culinary culture as well as agriculture to foster it, especially in the urban area to provide the locals with fresh vegetables. Some of these traditional Kyoto vegetables have been maintained, improved and passed down for generations to the present. Because of its long history and deep embeddedness into the traditional Japanese culture, Kyoto vegetables sometimes represent not just the local culinary culture but anything unique to Japan, underlying a soul of Japanese culinary culture: (i) Yusoku ryōri, or court cuisine; (ii) Shojin ryōri, or Buddhist vegetarian dishes; (iii) Kaiseki ryōri, or tea-ceremony dishes; and (iv) Obanzai ryōri, or ordinary local cuisine.

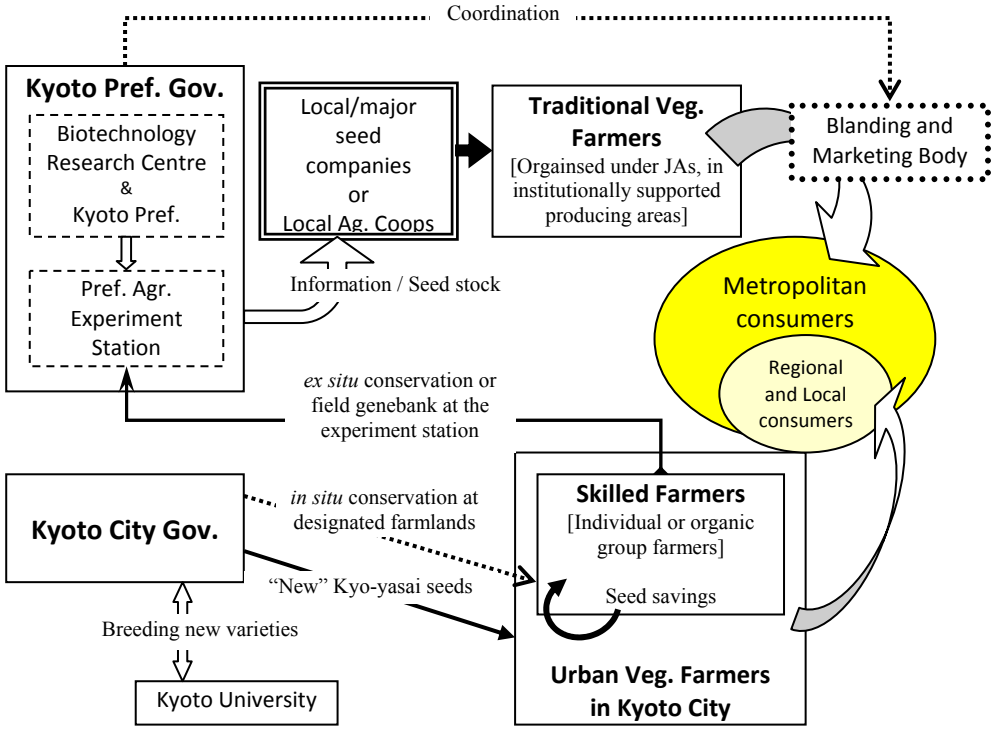
After the WWII, Japanese agricultural policy had been almost exclusively focused on the expansion of rice production, but faced with supply/demand mismatch in the late 1960s partly due to its too much success of rice production policy, and partly due to the westernisation of dietary habits. When the rice production adjustment policy was introduced in 1970, many regions, including Kyoto Prefecture, managed to shift from the rice sector to the high-value products sectors such as vegetables, fruit, and livestock. Given the prediction that market competition among production regions would be intensified even in these "alternative" sectors, and also given its less competitive nature of Kyoto agriculture (the average size of farms in Kyoto is 0.9 ha, whereas the national average size is 1.4 ha in 2009), Kyoto Prefectural government paid its attention to traditional vegetables (Kyo-yasai) so that they would be able to differentiate from others based on its competitive advantage (uniqueness), while capitalising on its high-valued brand image of "Kyoto". On the other hand, there were concerned voices from the demand side (e.g. local traditional restaurants) over declining production of Kyoto vegetables necessary for the traditional Kyoto culinary culture.

4.2. The role of Kyoto Prefectural government

Already in the early 1960s, Kyoto Prefectural government as well as Kyoto City government launched projects for collection, evaluation, identification and preservation of original strains of Kyoto vegetables. Kyoto Prefectural government set up preservation fields at the agricultural experiment station (agricultural research centre) in 1974. The Prefectural government also launched the foundation seed supply programme in 1977, in which certified seeds are multiplied by local JA cooperatives and member farmers, while some seed stocks are open to private seed companies. In 1983, the programme for promoting the traditional vegetable production was introduced, involving the agricultural cooperative (Kyoto Central Union of Agricultural Cooperatives) with the aim of expanding the production area of Kyoto traditional vegetables from the local (mainly within Kyoto City) to the regional (mainly in the Middle and Northern regions of Kyoto Prefecture) and marketing them through the mainstream channel (wholesale market system) towards the Metropolitan market. In 1989 the existing system was established for branding and marketing policy of Kyoto traditional vegetables. The Kyoto Vegetables Blanding and Marketing Association, an incorporated body of Kyoto Prefectural government, municipal governments, the Kyoto Agricultural Cooperatives and other agricultural organisations, is in charge of the coordination and the supervision of certification schemes for Kyoto Brand products (including *Kyo-yasai*). Up to now, 37 varieties of local vegetables (including 2 extinct varieties) are registered as Kyoto traditional vegetables (Kyo-yasai) and an additional 3 are registered as semi-traditional vegetables. Out of these 40 varieties, 13 varieties are included on the list of Kyoto Brand vegetables together with other 8 varieties from non traditional varieties. Those listed as Kyoto Brand vegetables are preferentially supported by the local governments and JA cooperatives for production and marketing from a strategic point of view. Some of the traditional varieties deposited at the experiment station and research centre have been improved for yield increase, disease tolerance, better taste, or easy cultivation, considering that many of local traditional varieties have disappeared due to their very unique traits unsuitable for commercial cultivation. Basic research on breeding is carried out by the Prefectural Biotechnology Research Centre in collaboration with Kyoto Prefectural University, while the experimental station takes charge of field experiments for the improvement of traditional varieties and production methods.

During the 1990s and the early 2000s, the branding and marketing policy of Kyoto traditional vegetables resulted in the expansion of production and sales with their names going nationwide. Considering that the branding and marketing policy is aimed at less competitive local agriculture and rural economies mainly in the Middle and Northern regions of Kyoto Prefecture, its genetic resource use and management of local traditional vegetables has been largely successful. However, it is not that simple. As Kyoto vegetables have become a big success on the market other prefectures and regions are rapidly catching up with Kyoto Model by exploiting their own local varieties at best, and at worst by appropriating Kyoto local

Figure 1. Actors and Flows of Local Traditional Seeds and Vegetables in Kyoto



knowledge and resources to produce Kyoto vegetables for their own benefit. This is because Kyoto's strategy of sales promotion in the metropolitan market and "unexpected" success has gone beyond the capacity of less competitive Kyoto agriculture, and therefore its short supply cannot meet the insatiable demand in the huge metropolitan market. Other prefectures and agricultural regions have also been also struggling to survive intense competition against cheap imports, which is now translated into increasing competition among domestic regions. Now, some of local traditional Kyoto varieties are not really unique to Kyoto. Indeed this seems to negatively affect attitudes of skilled farmers in Kyoto City area, and make them unwilling to share their own genetic resources in the formal seed systems as described below.

4.3. The role of Kyoto City government

Besides the Prefectural government, Kyoto City government has also been involved in the use and management of local traditional vegetables, but in a different way. Most local traditional Kyoto vegetables originated in Kyoto City area, where many skilled farmers traditionally cultivated local vegetables for local and regional (including Osaka) consumption. Although the area has been highly urbanised with the population of 1.5 millions now, there remain a certain number of skilled farmers who have managed traditional varieties *in situ* from generation to generation. Not just because Kyoto City government has no agricultural research facilities enough to take on the use and management of genetic resources, but rather because they trust to and respect for these local skilled farmers, Kyoto City government began to entrust some of these skilled farmers with keeping on production of seeds, regarding their farmland as *in situ* conservation fields already in 1962. At present there are 18 farmers designated for *in situ* conservation of 18 varieties of local traditional vegetables. The amount of JPY 21 000 paid for each variety per year is quite nominal, but sufficient to show the supportive approach of Kyoto City government to local skilled farmers and their seed saving practices. The City government is reluctant to collaborate with private seed companies even at the local level on the grounds that some companies once sold unattributed seeds under the name of traditional vegetables.

Kyoto City government policy does not necessarily intend to let local skilled farmers manage their genetic resources at their disposal. An officer in charge told the authors that it is not good idea for farmers to treat their heirlooms as family-secret assets and prevent them from being shared by other farmers or public research centres. Especially because these farmers are not exceptional to general downward trend of the agricultural sector in Japan and are worried to retire taking along with their heirlooms, though their conditions of farming are relatively stable and robust. What should be noted here is the fact that relatively competitive and robust conditions of urban agriculture, in which farmers can easily access directly to consumers and other special outlets (restaurants, natural food shops, and farmers' markets) and also small plots of their farmlands can be used for real-estate management enabling finance to their farming. But, of course, even those skilled urban farmers are under the pressure of urban development and faced with a lack of farm successors. Kyoto City agricultural policy is to larger extent aimed at urban agriculture, by promoting which consumers in the city are provided with fresh and seasonal vegetables, whether they are traditional or normal varieties. Therefore, other than nominal financial support to local skilled farmers, the City government supports those farmers (but not exclusively) in terms of their direct sales to consumers, for example. As of 2007, more than 600 farmers produce local vegetables under another brand of *Kyoto Shun-Yasai* (fresh and seasonal vegetables) authorised by the City government, covering 30% of locally produced vegetables.

4.4. Local farmers' point of views

Local farmers' responses to the above mentioned local governments' policies are also different between the "two Kyotos". Rural farmers in the Middle and Northern regions of Kyoto Prefecture are well organised under the JA cooperatives, with support from the Prefecture and municipality governments. But, they are largely new entry farmers in terms of growing Kyoto traditional vegetables without any special knowledge, skills, and resources. They are less interested in preserving traditional varieties as genetic resources, because seeds are sufficiently given through public and private seed systems (they purchase seeds from private seed companies through local JA cooperatives). Farmers interviewed by the authors are aware of the socio-ecological significance of seed saving especially in terms of making the most suitable seeds for their own farming conditions. However, they seem concerned about the deterioration of germination and seed quality likely caused by cross contamination and other factors due to their lack of knowledge and skills. Also, from the marketing point of view, farmers are recommended to follow the advice from local JA cooperatives about standardised seeds and techniques. They are more interested in selling their produce at a higher price on the market. But still, farmers who attempt to produce local traditional vegetables are more likely to empower themselves to meet high requirements from the market and consumers than those who produce normal vegetables. This is especially because of the conditions imposed on farmers and their farming communities to be officially designated as "producing districts" of the certain varieties of local traditional vegetables.

Kyoto City farmers, on the other hand, are largely individual, with some of them organised in organic farmers groups. They are confident and proud of their long-standing role in genetic resource management. They are less interested in the branding and marketing policy of the Prefectural government, since Kyoto City farmers (though their number is diminishing) are rooted in the local and have strong ties with local consumers through farmers' markets as well as local traditional restaurants and groceries. Although they are not necessarily against the role of formal seed systems, some regard their seeds as family-assets (heirlooms) and reluctant to share them with others. In the latter case, seeds are managed and used exclusively by themselves. Some heirlooms are deposited at Kyoto Prefectural Experiment Station, but only for preservation and research purposes, never to be exploited or marketed for commercial purposes.

5. LOCAL TRADITIONAL VEGETABLES IN NARA (*YAMATO-YASAI*)

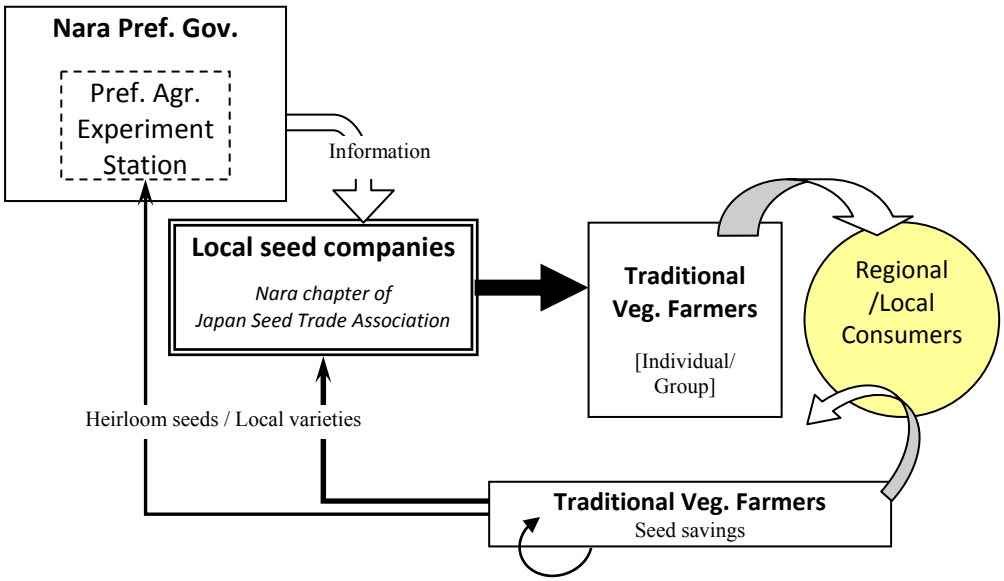
5.1. Background of Nara agriculture

The agricultural sector in Nara Prefecture is also less competitive, with the average farm size about 0.8 ha, even smaller than in Kyoto. Although Nara agriculture is traditionally famous for the production of some fruit and vegetables such as watermelon and strawberry (and therefore local seed companies are skilled at breeding these crops), it is ranked third from the bottom among 47 prefectures in terms of the total value of agricultural production. At the same time, Nara is also a historical city in the same way as Kyoto. There remain a lot of old temples, shrines, and local festivities, and especially the year 2010 marks the 1300th anniversary since the establishment of Heijo-kyo, flourished as Japan's first international capital, with a number of special commemorative events being held in and around Nara. Therefore, it is unlikely to be coincidental that Nara Prefectural government has been preparing the branding and marketing initiatives for local traditional vegetables since 2005. Following the Kyoto model, Nara Prefectural government has launched a programme to collect, evaluate and identify genetic resources of local traditional vegetables, and certify them as *Yamato-yasai*. The number of designated varieties of *Yamato-yasai* is 21 for now. The Prefectural government makes the list of these vegetables and encourage local producers, restaurants, consumers and communities to familiar with them by giving various information and recipes on the website, brochures and local newspapers. For the purpose of marketing to the mainstream (wholesale market systems), the Prefectural government, the Nara Prefecture Central Wholesale Market, and Nara JA cooperative established the promotion and certification council in 2009.

5.2. The role of Nara Prefectural government

The collection and evaluation of local traditional vegetables has been carried out by the prefectural experiment station, with the help of extension service agents visiting local farmers and communities to gather resources and the information about local traditional vegetables. Some varieties are deposited in the experiment station and kept for *ex situ* conservation. However, the experiment station so far has done nothing more than storing donated seeds of local traditional varieties. This is partly because some varieties are kept produced by a limited number of farmers in a few areas and seeds are exclusively grown by themselves, while other varieties are produced relatively widely in the prefecture with sufficient volume and quality of seeds available from local private seed companies. Apart from those managed

Figure 2. Actors and Flows of Local Traditional Seeds and Vegetables in Nara



and effectively used by local private companies, however, a government officer in charge showed to the authors his concerns over a possibility of disappearing or deteriorating of genetic resources if seed savings are exclusively entrusted to local farmers. This is especially true of *Yamato-yasai*, since some of those locally-limited traditional vegetables are grown in less favoured areas, not like in the case of Kyoto City's skilled farmers.

When it comes to the branding and marketing aspect of the *Yamato-yasai* initiatives, the Prefectural government is very positive and actively involved in the process. Especially the division of marketing wants to attach the brand image of Nara to its agricultural produce aimed at the metropolitan market, whereas with at this initial stage of the promotion policy the division of agricultural promotion seems reluctant to involve full-time professional farmers, for whom quite a marginal outlet for local traditional vegetables is considered difficult to cope. Instead, local agricultural corporations are expected to produce *Yamato-yasai* towards their own marketing channels.

5.3. Local seed companies' point of views

Some local private seed companies have sufficient resources, know-how, techniques, and facilities enough to use and manage genetic resources of local traditional vegetables. Even those varieties exclusively kept by local farmers are included in the depository of private seed companies, and therefore it is possible for them to breed and produce the seeds of such vegetable varieties. But, they respect those skilled farmers who have continued to grow and manage local traditional varieties, and therefore they have no plan to exploit genetic resources of such varieties without the farmers' agreement (they consider it as an unwritten rule among those involved in the seed systems).

At the same time, however, they are also worried about the erosion and discontinuity of genetic resource management if given over only to the local farmers' seed system. In this relation, a manager of one of local seed companies told the authors that the Prefectural government should play a key role to coordinate the genetic resource use and management of local traditional vegetables. The market for local traditional vegetables is still limited, and not yet matured to the level that private seed companies can find there a room for business. But still, he added that local seed companies are conscious of their expected role in the local agriculture, especially given that human and material resources of local JA cooperatives and public extension services in agriculture are diminishing. Indeed, as a part of corporate social responsibility and contribution to the local, member companies of the Nara Charter of Japan Seed Trade Association are involved in various projects aimed at supporting local farmers to provide local consumers with traditional vegetables, while taking part in the agriculture and food education in local schools. For these activities to be more feasible and sustainable, according to the above mentioned manager of the seed company, it is required that the local government will actively take charge of coordinating the relevant stakeholders with financial support or incentives.

6. DISCUSSION AND IMPLICATIONS

Although the need for sustainable genetic resource use and management is a long-standing issue, it is especially pressing now because genetic resources are a genuine and important component of biodiversity and curbing the continuing erosion of biodiversity is urgently needed as the global community has discussed for some time and agreed to do so within the framework of the Convention on Biological Diversity. On top of that, agricultural genetic resources in particular hold the key to global food security, and therefore the FAO has been working on the development of a comprehensive international framework to allow for improved management (conservation, exchange and sustainable use) of plant genetic resources for food and agriculture. In general, *in situ* conservation is considered the most appropriate way of conserving agro-biodiversity, while *ex situ* conservation can be complementary to *in situ* methods, especially in case the natural and socio-economical

conditions of the areas (farmlands in use) and actors (local indigenous farmers) involved in genetic resource management using *in situ* conservation would be deteriorated. Whatever methods are employed for the genetic resource management of local traditional varieties (maybe there must be various appropriate combination or cooperation between *in situ* and *ex situ* conservation methods), the primary objective is to preserve them as natural and/or cultural heritages, but without paying much attention to practical and effective use of these resources. It might be possible to keep growing just for preservation if farmers are financially sufficiently supported by the public sector. It might also be possible to keep growing for a niche market, through the "local production, local consumption" scheme, for example, and in this case farmers are supported by limited number of consumers. However, such possibilities are limited to very special cases, and therefore it is required to expand the growing areas for bigger markets by use of branding and marketing strategies. It is not exclusively local governments who can and should play such a role to promote branding and marketing of local traditional vegetables. What is pursued in the private sector, however, is to exploit genetic resources and develop new varieties for the commercial purpose. The outcomes of their research and development activities are quite likely to be protected as intellectual property, making (primary and secondary) resources difficult to be shared among stakeholders. It is in this context that the international mechanisms are being negotiated to address the issue of the access and benefit sharing of genetic resources.

Throughout this paper, we put the issue of genetic resource use and management in the context of Japanese agriculture, and have found that:

(i) Individual and/or collective efforts to practice seed savings at the local are emerging and should be encouraged further, but *in situ* conservation, whether it is consciously aimed at or not, is not necessarily stable nor sustainable given that the agricultural sector in Japan is shrinking rapidly to the extent that even highly motivated farmers sometimes find it difficult to keep farming and pass their knowledge, techniques, and resources (heirlooms) onto the next generation. *In situ* conservation by local farmers will be feasible and sustainable only if they can keep on growing seeds and crops even in the difficulties of local agriculture and rural economies. In addition, given the reasons why local traditional varieties in many regions have been disappearing, public research organisations (and in some cases private seed companies) need to be involved in the improvement of traditional varieties and their producing methods, and also development of "new" traditional varieties, for yield increase, disease tolerance, better taste, easy cultivation and distribution, for example. This is only possible if genetic resources are collected, evaluated, identified and preserved at agricultural experiment stations as in the case of *Kyo-yasai* (and some other examples such as *Naniwa-yasai*, *Hiroshima-Otakarayasai*, and *Shinshu-no-Dentouyasai*).

(ii) While the national genebank and the network of sub (regional) genebanks are a typical example of *ex situ* conservation and functioning very well as such, agricultural experiment stations at the prefecture level are also working on genetic resource management of their local traditional varieties by use of field genebank methods. Apart from their primary limitations on the grounds that genetic resources are disconnected from the original socio-environmental conditions, local governments are held accountable for their long term cost and efforts. More robust and practical justifications than just preserving genetic resources are required in the face of financial difficulties. To this effect, *ex situ* and field genebank conservation will be feasible and effective only if they are constantly used for agricultural production and get feedback from the field, with a perspective of the positive impact on local agriculture and rural economies as in the case of *Kyo-yasai*.

(iii) Although the involvement of private seed companies in genetic resource management is mainly aimed at exploiting resources and making profit from them, it is also true that they have a lot of know-how, technologies, resources, and facilities necessary to contribute to genetic resource use and management of local traditional varieties. Indeed, some of locally-based small and medium sized companies are willing to collaborate with other stakeholders to encourage local production and local consumption of traditional vegetables as seen in the

case of Nara *Yamato-yasai* (and some other examples such as *Kaga-yasai* and *Aichi-no-Dentouyasai*). What they request is a role of local government to coordinate genetic resource use and management and financially support activities of various stakeholders at the local.

Given these situations and conditions, it might be safe to say that branding and marketing strategies for local traditional varieties adopted by some local governments to boost their local agriculture and rural economies is an option. However, how to create shared value among stakeholders is another issue to take into consideration. And, how to define the local is also intricate question.

Skilled farmers in Kyoto City are sceptical of the promotion and expansion of production and distribution of *Kyo-yasai*, and to some extent Nara farmers of special varieties of *Yamato-yasai*, on the grounds that seeds of local traditional vegetables that they have managed for generations are considered as their heirlooms and therefore constrained to be shared as commons beyond the local. Although they have relatively stable and sustainable basis for the production, their practices of *in situ* conservation need to be institutionalised (combined or integrated with *ex situ* conservation systems) as generally agreed. Still, it would be difficult to persuade these farmers to share their resources with other stakeholders. As described before, Kyoto agriculture is less competitive and cannot compete with other prefectures and major production regions once they catch up with Kyoto in producing and marketing same kinds of local traditional vegetables. Kyoto Prefectural government acknowledges this now and since the middle of 2000s, its branding and marketing policy has been modified to focus more on local and regional markets by familiarising the Kyoto Brand mark among the local/regional consumers, and organising the network of restaurants and retail shops where *Kyo-yasai* for both fresh and cooked are available. In the case of Nara Prefecture, local seed companies have launched a project to support local activities for "local production, local consumption" as well as "food and agriculture education in schools" with support from the Prefectural government (not enough though). Also in other prefectures (e.g. *Naniwa-yasai* in Osaka) genetic resource use and management of local traditional vegetables tend to be integrated within their institutional approaches towards the revitalisation of local agriculture and rural economies by linking local production and local consumption, partly through the market system and partly through the community level activities.

As discussed in Louwaars (2007), given their own specific advantages and limitations of both farmers' and formal seed systems, what can/should be proposed is diversified seed systems with different tasks for private seed companies, public sector institutions, and civil society initiatives in order to develop optimal linkages between local and formal knowledge and local and formal genetic resources. By contextualising such discussions in the realities of Japanese agriculture, we move on to a more pragmatic approach to integrate formal seed systems and farmers' seed systems at the local level: **locally-integrated multi-stakeholders' seed systems**, in which local governments will be expected to coordinate the use and management of local genetic resources by involving local skilled farmers (with their local traditional expertise and resources), agricultural experiment stations and research centres (with their scientific expertise necessary to sustainably conserve resources and improve their traits for further utilisation), public extension agents and local agricultural cooperatives (through their farm guidance activities), local seed companies (with their business expertise and resources to meet the market demand at the local and regional), local farmers who grow local traditional varieties, and local communities and consumers (with their acknowledgement of ecological and socio-cultural significance of local traditional varieties), based on their shared value to their local agriculture and rural economies, while addressing more broad issues of genetic resource conservation.

NOTE

1. As is often the case with other developed countries (Almekinders & Jongerden 2002), increasing demand for organic seeds is another important factor behind the growing attention to farmers' seed system also in Japan. What should be considered in this regard is how to secure the stable supply of organic seed both in terms of the volume and quality of seed varieties available outside of the formal seed system. While major seed companies and public agricultural research centres have been interested in neither local varieties nor organic farming, some of small and medium sized local seed companies are involved in breeding and seed production of local traditional varieties partly for organic farming, but with less resources and small geographical scope of activities. Organic farmers and their association are collaborating with each other by building a network for their seed supply, but with lack of expertise. Against this background, what is interesting to see is changing market and policy conditions in favour of organic farming in Japan. Firstly, the organic market is growing rapidly enough to boost organic farming, and attract corporate interests in to the sector since the introduction of the JAS organic certification scheme in 2000 (including the certification for organic seed production). Secondly, under the new law enacted in 2006 to promote organic farming, public agricultural research centres (national and prefectural experimental stations) are now encouraged to increase their R&D and extension efforts to support organic farming. The authors are working also on the conditions, potentiality and limitations of farmers' seed system for organic farming (Imaizumi 2010), following the current research project about the institutionalisation of genetic resource management in the case of local traditional vegetables.

2. It is only Mitsui Chemicals and Nakajima Yoshio Shoten (the latter has succeeded to Mitsubishi Chemical's rice seed business) that still stay in the business on commercial base.

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